



FEED ^{THE} FUTURE

The U.S. Government's Global Hunger & Food Security Initiative



PROCEEDINGS

USAID/ENGINE RESEARCH SYMPOSIUM

ADDIS ABABA, ETHIOPIA

JUNE 27-28, 2016

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1. Introduction

As part of the USAID/ENGINE program's rigorous research and learning agenda, researchers and students from Tufts University and its partners Jimma University, Hawassa University and EPHI have developed and implemented several studies that are examining the linkages and relationships of agriculture to nutrition including but not limited to policy, service provision, better understanding the outcomes that need to be achieved and understanding the effectiveness of intervention strategies and approaches in reaching the intended target. The research and learning agenda also aims to increase capacity in the realm of nutrition policy and programming research with eight PhD students (Ethiopian) utilizing data generated from the learning agenda for their dissertations.

2. Objectives of the Symposium

The objectives of the Symposium are to disseminate some of the key findings that are emerging from USAID/ENGINE's rigorous research and learning agenda that is being led by the Friedman School of Nutrition Science and Policy at Tufts University.

3. Content of the Symposium

Generally, the two days research symposium provided an exciting and proactive opportunity for the exchange of ideas related to key findings that are emerging from USAID/ENGINE's rigorous research and learning agenda. The abstracts were organized into the following four subthemes. Maternal nutrition in Ethiopia, Acute malnutrition in Ethiopia, Factors affecting maternal nutrition and birth outcomes in Ethiopia and Multi-sectoral, nutrition specific and nutrition sensitive interventions and nutritional status in Ethiopia.

4. Methods

The USAID/ENGINE research symposium used oral and poster presentation methods to communicate the different research topics with the audience. Questions and General discussions and suggestions were an approaches used during the symposium. Each session was moderated by distinguished professionals who have ample knowledge and experience for each presentation. The moderators first introduced the topic of the presentation, introduced each speaker in turn and keep track of time allotted to each speaker. When the speakers are finished, they recognize questions from the audiences, repeat the questions for the benefit of the audience and assign a speaker to answer each.

5. Participants

The symposium was attended by over 105 participants delegated from governmental, non-governmental and academic organizations that include representatives from FMOA, FMOH, FMOE EPHI, USAID, EU, UN organizations (WHO, FAO, UNDP, UNICEF, WFP), Universities (Jimma, Hawassa, Haromaya, Bahirdar and Wolayita Sodo, Addis Ababa universities), NGOs (SCI, Jhpiego, JSI/SEUHP, MI, Land O'Lakes, FANTA, FHI360, Gates Foundation, Irish Aid, World Vision, Mercy Corps) and selected Woreda health offices (Gomma, Woliso and Tiro-Afeta Woreda health offices).

DAY ONE

6. Official Opening Ceremony

6.1. Program Introduction

The session commenced with the program introduction by Dr. Habtamu Fekadu, ENGINE Chief of Party. On behalf of ENGINE program and himself, Dr. Habtamu expressed his pleasure in welcoming participants and partners to this research

symposium and he invited Mr. John Graham, SCI country director, to give an opening speech.

6.2. Welcoming Address



John Graham is the country director for Save the Children in Ethiopia. He has been working in the country since 1997, but his first involvement with Ethiopia goes back to before the 1984 famine when he supported cross-border operations into the liberated zones in Tigray and Eritrea. In his current role he leads Save the Children's diverse programming in Ethiopia addressing education, health, food security, HIV/AIDS prevention/education and saving newborn lives.

John Graham

The symposium was officially opened by Mr. John Graham. In his opening remark, Mr. John emphasized on three points: Food security in Ethiopia and nutritional status among under five years of children, impact of ENGINE program in operational woredas, such as ENGINE activities in linking nutrition, livelihood and food security and capacity building activities done at different sectors

6.3. Keynote Address

Invited by Dr. Habtamu Fekadu, Mr. Dennis Weller (USAID Mission Director), Prof. Fikre Lemessa (Jimma University President) and Dr. Amha Kebede (EPHI Director General) had delivered keynote speeches.

6.3.1. Mr. Dennis Weller (USAID Mission Director)



Dennis Weller assumed leadership of USAID Ethiopia in 2012. USAID Ethiopia is one of the largest USAID missions in Africa and is a focus country for presidential initiatives covering HIV and AIDS, malaria, child survival, agricultural growth, food security and nutrition, climate change and energy. Weller has 30 years of experience with USAID, including work in Ghana, Rwanda, Burma, Pakistan, Kenya and Iraq. Much of his work has focused on providing emergency food aid and improving agricultural growth to avert hunger and ensure economic development. He began his career as a Peace Corps Volunteer in Malaysia.

Dennis Weller

Mr. Weller emphasized on the importance of capacity building and generation of evidence to help decision makers. Furthermore, he mentioned the current El Nino driven drought and its effect over the coming lean seasons especially in terms of malnutrition and this could affect the health of affected population and economy of the country if left unaddressed. He then concluded his speech by thanking the institutions which organized the symposium and extending his wish that the discussion in the symposium will help future objectives of Ethiopia in tackling nutritional problems in the country.

6.3.2. Prof Fikre Lemessa (Jimma University President)



Prof. Fikre Lemessa

Dr. Fikre Lemessa is the President of Jimma University. He received his BSc in Plant Sciences, MSc in Plant Protection from Haramaya University, Ethiopia and PhD in Horticultural Sciences (Plant Pathology) from the Leibniz University of Hannover, Germany. He also serves as an Associate Professor of Plant Pathology and Horticultural Sciences at Jimma University. Dr. Fikre has been involved in teaching, research and student advisory services for more than two decades. He has been offering several courses to undergraduate and postgraduate (MSc and PhD) students in various universities of Ethiopia. He has published more than 25 multidisciplinary research papers in national and international peer reviewed journals in the areas of agriculture and life sciences. He has served as editor of different national and international journals. He has supervised more than 30 postgraduate (both MSc and PhD) students in national and international universities.

Prof. Lemessa started his speech by thanking all participants. He described the linkage of the project with the University as a perfect match of the visions and missions of the university and explained the process how the PhD program is running mentioning the link between European universities and Jimma University in Ethiopia. He also mentioned the various studies (Ag-Nut, BC, MAM, SAM) are important in targeting the nutritional problems in the country. He mentioned though the project is coming to its end, it has provided the necessary resources for the PhD students and all other to generate evidence. He promised Jimma University will do all what is required for the realization of the objective of the project.

6.3.3. Dr. Amaha Kebede (EPHI Director General)



Dr. Amaha Kebede:

Dr. Amha Kebede is the Director General of the Ethiopian Public Health Institute (EPHI). He received his PhD in Biomedical Science in 2005 from Addis Ababa University and Leiden University, The Netherlands and earned the MSc in Molecular Biology at Free University of Brussels Belgium in 1997. His career includes 25 years at EPHI where he is a full time researcher, has held leadership positions as Head, Infectious and Other Diseases Research Department, and was Deputy Director General for Research and Technology Transfer. He has been Director General since March 22, 2011. As the DG, he is responsible for managing EPHI's research activities and ensuring that they generate evidence-based knowledge to further the Ministry of Health's efforts to improve the health of the population.

Dr. Kebede also started his speech by thanking the participants and organizers. He mentioned that malnutrition is one of the main causes of mortality and morbidity and addressing it is one of the key strategies to achieve the SDGs. He said that the recent micro nutrient survey revealed deficiencies in various micro nutrients among the population. Since then the government has committed to undertake various tasks one of which is the Sekota declaration where strategies to reduce stunting to the level “0” by 2030. He further extended his hope that the research findings from the engine research projects will have paramount importance in the evidence generation for this commitment. As the previous speaker, he also appreciated the strategy of capacity building among the institutions through the project. After thanking all who have played a role in the process, he officially opened the symposium.

Day one presentations

7. Background

7.1. Overview of ENGINE program and Research and Capacity Building

Dr. Habtamu delivered a presentation on overview of ENGINE program and Research and Capacity activities. He highlighted that ENGINE program is USAID Mission's flagship five-year (2011-2017) multi-sector and preventive nutrition project focusing on first 1000 days and funded by USG Global Health and Feed the Future Initiatives. He also mentioned that the program is implemented under the framework of the National Nutrition Program (NNP) by Save the Children in partnership with Tufts University,

Land O' Lakes, Jhepigo, Jimma University, EPHI and other three local NGOs. He mentioned that the ENGINE program conducted a big nutrition research and research capacity building in the country; research projects such as Birth cohort study, Agriculture nutrition panel study, Nutrition policy research, and studies on SAM & MAM. Seven PhD students from local institutions are being pursuing their studies at Jimma and European Universities. More than 200 MSc thesis work on nutrition from six universities were sponsored and quality of nutrition education in 13 health and agriculture colleges, five health universities, four regional agriculture and four health colleges were improved. Academic centre of excellence for nutrition research was established in Hawassa University with the support from ENGINE program. Finally he conclude his presentation by presenting the time table of the Tufts University led research work that it was started in March 2012 stakeholders meeting to set research agendas, data collection finalized in March 2016 and the research dissemination symposium is organized today June 27 & 28, 2016.

7.2. USAID/ENGINE Research and Learning Agenda Planning & Implementation of Birth Cohort Study and Agriculture Nutrition Pane Study

7.2.1. Birth Cohort Study

Dr. Shibani Ghosh (principal investigator for the Birth Cohort study) presented how the ENGINE study project was designed, how the data was collected and the data analysis progress so far. She stated that Tufts University leads the objective of the development and implementation of a rigorous and innovative research and learning agenda partnering with local institutions in research and capacity development, including: Jimma University, Hawassa University and the Ethiopian Public Health Institute (EPHI). She indicated also that the research component affords ENGINE the unique opportunity to provide policy makers with information to enable decision making around programs, on key nutrition concerns and their management and alleviation at a population level. The research project was first started with a multi-institutional (donor, government, NGO, university) stakeholder workshop and research prioritization process conducted on March 2012. Dr. Ghosh also mentioned that during that workshop more than 19 different nutrition and health related research questions were identified and later were span into the following three thematic areas to inform USAID's Feed the Future evaluation and learning agenda and to provide evidence to inform Ethiopian Government policy and programming.

- Policy Drivers, Service Delivery and Provision
- Outcomes Research within the context of intervention strategies and approaches

- Effectiveness research to understand program implementation and impact (coverage, exposure, adherence in relation to expected outcomes, and impact assessment)

Then she explained details about the birth cohort study. The birth cohort study is a quasi-experimental observational study on households with three study arms following pregnant women and their child from birth until 12 months of age in three districts of Oromia regional state (Woliso, Tiro-Afeta and Gomma). And the objective of the study was to examine the interactions of nutrition specific and nutrition sensitive actions and maternal and infant health and nutrition outcomes. The birth cohort study was coupled with annual institutional interviews of health service delivery workers including Health Extension workers (HEW) and health workers (HW) and agricultural extension/education agents called Development agents (DA). Summary of the study was presented in table form as below.

Time point	Description	Interviewee	Sample size	% of expected
1	Prenatal 1 (enrollment)	Woman/household head	4680	100.0%
2	Prenatal 2 (if applicable)	Woman	902	19.3%
3	Immediately after birth through 3 days after birth	Woman	4658	99.5%
4	Infant is 3 months (+/- 2 weeks)	Woman	4289	91.6%
5	Infant is 6 months (+/- 2 weeks)	Woman	4179	89.3%
6	Infant is 9 months (+/- 2 weeks)	Woman	4115	87.9%
7	Infant is 12 months (+/- 2 weeks)	Woman/household head	3728	79.7%

So far six manuscripts were produced from the birth cohort study.

1. Factors associated with Low MUAC in pregnant women in three woredas of Oromia, Ethiopia
2. Factors associated with birth weight, length and length for age in three woredas of Oromia, Ethiopia

3. Factors associated with anemia in pregnant women in three woredas of Oromia, Ethiopia
4. Understanding Service Provision around Health and Nutrition in Select Woredas of Oromia Region in Ethiopia
5. +2 PhD manuscripts

Finally Dr. Ghosh acknowledged all those who directly or indirectly contributed to the implementation of the study and concluded her presentation. Laud round of applause.

7.2.2. Agriculture Nutrition Panel Study

Following Dr. Shibani Ghosh's presentation, Dr. Jenniefer Coates (Ag-Nut panel study principal investigator) presented the overall design and current status of the ENGINE Agriculture Nutrition Panel study. The study was conducted in ten different Woredas in Oromia and SNNP regional states. In each Woreda in turn two kebeles were selected (one with ENGINE nutrition specific intervention and one with Nutrition specific + Nutrition sensitive interventions). Overall 1200 households were included in this study. The study participants includes adult female, adult female and care taker of under five children and the questionnaire was organized accordingly.

1. **Adult Female:** water and sanitation, household diet, food security, social networks, female empowerment in agriculture, program exposure and uptake, livestock product production, time allocation, homestead garden production, food expenditures, anthropometry
2. **Adult Male:** time allocation, sanitation, asset ownership, farmer association participation, program exposure and uptake, ag production and marketing, labor allocation, ag technology and management practices, income, expenditure, savings, shocks, anthropometry.
3. **Mother/Caretaker of child <5 yrs:** women's and child health status, illness episodes, infant and child feeding practices, nutrition knowledge, mother and child anthropometry

The data were collected longitudinally, four times six months apart from Feb. 2014 to Nov. 2015.

Round	Seasonality	Start Date	Completion Date
One	Post-Harvest	Feb, 2014	April, 2014
Two	Pre Harvest	Sept, 2014	Nov 19, 2015
Three	Post-Harvest	March, 2015	April, 2015
Four	Pre Harvest	Sept, 2015	Nov, 2015

So far seven manuscripts were produced from the Ag-Nut panel study

1. Determinants of Participation in the “Nutrition-sensitive” Agricultural Activities of a Large-scale Integrated Nutrition Program in Ethiopia
2. Predictors of participation in nutrition-specific activities
3. Production Diversity, Agricultural Commercialization, Women’s Empowerment, and Dietary Diversity
4. Filling a dietary data gap? Validating the Adult Male Equivalent method of estimating individual nutrient intakes from household-level data in Ethiopia and Bangladesh
5. Nutrient intensity of production and expenditure
6. Predictors of Intra-household food and nutrient allocation inequity in Ethiopia
7. Predictors of ‘diet diversity smoothing’ during the lean season in Ethiopia
8. + Manuscript from PhD students: Ethiopia based (2), US (1)

8. Oral Presentations

Session I: What do we know about maternal nutrition in Ethiopia?

8.1. Factors associated with low Mid Upper Arm Circumference in pregnant women in Ethiopia

Shibani Ghosh, Meghan Kershaw, Kathryn Spielman, Kidane Ayele, Yitbarek Kidane, Krista Zillmer, Ashish Pokharel, Jeffrey K. Griffiths and Tefera Belachew

Background: Mid upper arm circumference (MUAC) in pregnant women is significantly associated with low birth weight and pregnancy weight gain is associated with infant weight-for-age, length-for-age and

weight-for-length. The aim of this study was to examine factors associated with low MUAC in pregnant women in Oromia region of Ethiopia.

Methods: Data used in the analysis are from the first time point, which is the recruitment time point (recruitment of pregnant women) in the of the ENGINE birth cohort study and include, the use of antenatal services, maternal anemia, food security status, maternal literacy and numeracy, maternal dietary diversity (Minimum Dietary Diversity Score), household wealth index, crop production diversity, livestock ownership diversity and livestock product diversity. Descriptive statistics, means and standard deviations were generated and bivariate relationships tested followed multivariate logistic regression modeling. Standard errors were clustered at the kebele level and interactions explored.

Results: Every increase in wealth index quintile lowered the risk of MUAC < 23 cm by 11%. A literate woman has a 20% lowered odds of MUAC < 23 cm compared to a non-literate woman while a numerate woman has a 30% lower risk of low MUAC. Altitude-adjusted anemia, HFIAS, and pregnancy trimester, fasting were all significantly associated with increased odds of MUAC < 23 cm with OR of 1.3 ($p=0.004$), 1.04 ($p=0.000$), 1.27 ($p=0.001$), 1.84 ($p=0.000$) respectively.

Conclusions: Women with MUAC < 23 cm are at a higher risk of poor birth outcomes. In a longitudinal study, we find that anemia, food security, trimester time period, the practice of fasting and distance to health services increases the odds of a low MUAC, while wealth, literacy, numeracy and access to a market have a protective effect.

8.2. Understanding Service Provision around Health and Nutrition in Select Woredas of Oromiya Region in Ethiopia

Meghan Kershaw, Ashish Pokharel Kidane Ayele, Yitbarek Kidane, Jeffrey K. Griffiths, Tefera Belachew and Shibani Ghosh

Background: Ethiopia, a country of 94.1 million people, with nine regions and two city administrations and a population growth rate of 2.6%, has high rates of infant mortality (52 per 1000) and high rates of malnutrition in infants and young children. The Government of Ethiopia has accelerated its efforts to enhance good nutrition practices through health education and service provision. The Health Extension Programme (HEP) has incorporated nutrition within the basic health service package since 2006, a key issue to understand is the quality and capacity to implement the nutrition components of the health service package.

Objective: To gain understanding of the knowledge, attitudes and practices of frontline workers (FLWs) in select woredas in Oromia region.

Methods: The study areas were three woredas (Gomma, Woliso and Tiro Afeta) in the Oromia region. Five hundred sixty FLWs (155 Health Extension workers, 206 Health Workers and 199 Development Agents) were interviewed. Data were collected electronically on knowledge of nutrition situation in the area, available program and health services, training and the work environment, constraints in service provision, and knowledge and attitudes. Interviews were conducted from March – May 2015. A follow-up interview was conducted March-May 2016. Analysis was conducted using STATA and Microsoft Excel. The three cadre of workers include health workers (HW), health extension workers (HEW) and development agents (DA).

Results: Sixty percent of all respondents in Tiro Afeta, 51% in Gomma and 40% in Woliso were women. Respondent age ranged from 26-27 years. Respondents had lived in Gomma and Woliso for a median of five years and 3.5 years in Tiro Afeta.

Nutrition Situation Awareness: 37% of all frontline workers considered nutrition a problem in mothers in their catchment area. At the woreda level, 75% of FLWs in Tiro Afeta, 25% in Gomma and 35% in Woliso reported nutrition of mothers as a problem. A total of 41% considered nutrition a problem in infants and young children in their area (24% in Gomma, 82% in Tiro Afeta and 39% in Woliso). Specifically by cadre, we find that 44% of Development agents, 30.5% of Health Extension workers and 48% of health workers considered nutrition a problem in infants and young children while 42% of DAs, 26% of HEW and 41% of HWs considered nutrition a problem in reproductive age women. Thus the highest respondent rate was in Tiro Afeta, in contrast, examining the prevalence of low mid upper arm circumference in pregnant women (Low MUAC), we find that while the prevalence is highest in Tiro Afeta (55%), was also relatively high in both Gomma (35%) and Woliso (42%).

Service Usage: In both Gomma and Wolisa, between 92 to 98% of DAs, HEW and HWs reported that household frequently used their services (either agricultural or health) but only 54% of DAs, 68% of HEWs and 75% of HW reported being able to meet the needs of the households. In the case of Tiro

Afeta, only 58% of DAs, 70% of HEW and 82% HW reported regular use of services by households with only 30% of DAs, 55% HEWs, 57% of HWs reporting being able to effectively meet the needs of the population. In the case of Gomma, 92% of DAs, 95% of HEWs and 98% HW reported that households regularly use their services however 73% of DAs, 92% of HEWs and 84% of HWs reported being able to effectively meet the needs of the population. Finally in Woliso, between 97-98% of DAs, HEWs and HWs reported that household regularly use their services however only 50% of DAs, 47% of HEWs and 73% HWs reported that they were able to effectively meet the needs of the population.

Training: Most agreed that there was need for refresher training in their field of expertise (all cadres) (70% Gomma, 50% in Tiro Afeta and Woliso). Specifically 47% of DAs, 54% HEWs and 70% of HWs agreed that there was need fore refresher training within their field. At the woreda level this translated into 58% DAs, 56% HEW and 92% HW in Gomma, 42% DAs, 50% HEW and 60% HW in Tiro Afeta and 39% DAs, 54% HEW and 53% HW in Woliso. We find that 35% of DAs, 83% HEW and 91% HW had received nutrition training though this training could have been received anywhere in the past 6 months to greater than 5 years. At the woreda level, 41% DAs, 96% HEW and 98% HW in Gomma, 20% DAs, 91% HEW and 91% HW in Tiro Afeta and 38% DAs, 61% HEW and 84% HW in Woliso had received nutrition training.

Nutrition and Health Education and Counseling: Fifty eight percent of health workers confirmed providing nutrition and health education (across all woredas). By woreda, 60% and 80% Health workers in Gomma and Tiro Afeta respectively confirmed provision of health and nutrition services and counseling compared to 46% in Woliso. Despite high nutrition knowledge (96% of all health workers correctly answering 4 nutrition questions), only 57% Health workers in Gomma, 44% in Tiro Afeta and 60% considered provision of nutrition education and counseling was their responsibility. Furthermore, we found that 90% of health workers in Gomma, 55% in Tiro Afeta and 92% in Woliso stated that the time they have to spend on nutrition and health counseling/education was not sufficient.

Conclusions: Several issues and challenges have been identified in the first survey of FLWs, with special focus on the issues and challenges around health workers and health extension workers. This includes insufficient time for provision of nutrition and health counseling by health workers, need for refresher training across all the cadres, that nutrition training was mostly provided at the kebele level. There was low involvement in Woliso in the provision of health and nutrition education with a high number of health workers perceiving that nutrition was not their responsibility. In two of the three woredas, low percentage of FLWs considered nutrition as a problem despite the prevalence of low MUAC in pregnant women in these woredas being relatively high. Additional analyses are being conducted to examine the effect of work environment, further incentives and disincentives towards service provision. Separate analyses are being conducted in understanding service provision, incentives and dis-incentives around the activities implemented by development agents.

8.2. Prevalence and Predictors of Anemia: Women of Reproductive Age in Ethiopian

Dilnesaw Zerfu, Tefera Belachew, Pernille Kæstel, Tsinuel Girma and Henrik Friis

8.3. Prevalence and Nutritional, Obstetric and Socio-demographic Determinants of Prenatal Depression in South-West Ethiopia: A Community Based Study

Yitbarek Kidane Woldetensay, Tefera Belachew, H.K. Biesalski, Eva Johanna Kantelhardt and Veronika Scherbaum

Session 2: What do we know about acute malnutrition in Ethiopia?

8.4. Nutritional and Health Related outcomes of children treated for severe acute malnutrition in a community based program, Jimma Zone, Ethiopia

Tsinuel Girma, Alemseged Abdissa, Yesuf Getu Philip James, Kate Sadler and Paluku Bahwere

Background: Severe acute malnutrition (SAM) is a major public health problem in Ethiopia and responsible for over half of deaths among Under-5 children. Recently, Ethiopia has seen significantly improved coverage of the community-based management of acute malnutrition (CMAM), mitigating SAM and reducing child mortality by 60 percent in two decades and reversing malnutrition trends. However, there is limited data on long term outcomes following discharge from SAM treatment. This study therefore aimed to determine the survival, nutritional and health outcomes of children who had recovered from SAM.

Methods: This prospective cohort study was conducted in Jimma zone on post-SAM cases (n=203) and their non-wasted, age- and sex- matched controls with no particular intervention. A one-year follow up was done monthly and data on nutrition status, morbidity and vital status were collected at each visit. Data on body composition and haemoglobin were collected at enrolment and six months later.

Results: The study indicates that post-SAM children had a better morbidity and mortality profile than those of similar cohorts followed in other countries. However, when compared to non-wasted controls children from the same community they remained more vulnerable and had more incident episodes of acute malnutrition and infectious diseases, and at the end of follow up they had not yet caught up the controls in term of anthropometric indices, lean mass and “cellular health” parameters.

Conclusions: Overall our results indicate that children recovering from SAM and discharged using current criteria still need particular attention during the first three to four months after discharge and that research is urgently needed to determine the appropriate package of interventions that may accelerate catch up growth and complete recovery. There is evidence for fat mass catch-up at discharge from CMAM that was also sustained; this could increase the risk of metabolic abnormalities in the long-term.

8.5. Children with Moderate Acute Malnutrition with No Access to Supplementary Feeding Programmes Experience High Rates of Deterioration and No Improvement: Results from a Prospective Cohort Study in Rural Ethiopia

Philip James, Kate Sadler, [Mekitie Wondafrash](#), Alemayehu Argaw, Hanqi Luo, Benti Geleta, Kiya Kedir, Yilak Getnet, Tefera Belachew and Paluku Bahwere

Background: Children with moderate acute malnutrition (MAM) have an increased risk of mortality, infections and impaired physical and cognitive development compared to well-nourished children. In parts of Ethiopia not considered chronically food insecure there are no supplementary feeding programmes (SFPs) for treating MAM. The short-term outcomes of children who have MAM in such areas are not currently described, and there remains an urgent need for evidence-based policy recommendations.

Methods: We defined MAM as mid-upper arm circumference (MUAC) of ≥ 11.0 cm and < 12.5 cm with no bilateral pitting oedema to include Ethiopian government and World Health Organisation cut-offs. We prospectively surveyed 884 children aged 6–59 months living with MAM in a rural area of Ethiopia not eligible for a supplementary feeding programme. Weekly home visits were made for seven months (28 weeks), covering the end of peak malnutrition through to the post-harvest period (the most food secure window), collecting anthropometric, socio-demographic and food security data.

Results: By the end of the study follow up, 32.5% (287/884) remained with MAM, 9.3% (82/884) experienced at least one episode of SAM (MUAC < 11 cm and/or bilateral pitting oedema), and 0.9% (8/884) died. Only 54.2% of the children recovered with no episode of SAM by the end of the study. Of those who developed SAM half still had MAM at the end of the follow up period. The median (interquartile range) time to recovery was 9 (4–15) weeks. Children with the lowest MUAC at enrolment had a significantly higher risk of remaining with MAM and a lower chance of recovering.

Conclusions: Children with MAM during the post-harvest season in an area not eligible for SFP experience an extremely high incidence of SAM and a low recovery rate. Not having a targeted nutrition-specific intervention to address MAM in this context places children with MAM at excessive risk of adverse outcomes. Further preventive and curative approaches should urgently be considered.

Session 3: Factors affecting maternal nutrition and birth outcomes in Ethiopia

8.6. Factors associated with Anemia in Pregnant women in Oromia Region, Ethiopia

Krista Zillmer, Ashish Pokharel, [Kathryn Spielman](#), Meghan Kershaw, and Shibani Ghosh

Introduction: Anemia among pregnant women is associated with higher risk of low birth weight and both maternal and perinatal mortality. Therefore, it is a critical public health issue. Despite previous studies examining factors associated with anemia in Ethiopia, there remains little consistent and conclusive evidence that can be used to guide policy and programmatic action. The objective of this study was to examine the association between anemia status in pregnant women with various health, behavioral, and socioeconomic factors in pregnant women in Oromia region of Ethiopia.

Methods: Data used in the analysis are from the first time point, which is the recruitment time point (recruitment of pregnant women) in the ENGINE birth cohort study and include maternal health characteristics, food security status, maternal literacy and numeracy, maternal dietary diversity (Minimum Dietary Diversity Score), household wealth index, crop production diversity, livestock product diversity. Descriptive statistics, means and standard deviations were generated and bi-variate relationships tested followed by iterative multi variate logistic regression modeling. Standard errors were clustered at the kebele level.

Results: Household food insecurity access (HFIAS), low maternal MUAC, previous pregnancies, and Muslim were associated with increased odds of anemia, with odds ratios of 1.02, 1.33, 1.49, and 1.66 respectively. For each additional point on the handwashing score scale, odds of anemia were reduced by 11%. Numerate women had 30% lower odds and participation in any form of fasting practice showed a 21% reduction in the odds of anemia.

Conclusions: Women who are anemic during pregnancy are at a higher risk of poor birth outcomes and mortality. We found that household food insecurity, low maternal MUAC, previous pregnancy, and those who identified as Muslim had significantly increased odds of anemia. Numeracy and better handwashing practices significantly reduced the odds of anemia.

8.7. Factors associated with birth weight and length in Ethiopia

Shibani Ghosh, Meghan Kershaw, Krista Zillmer, Leslie Wentworth, Kathryn Spielman, Kidane Ayele, Yitbarek Kidane, Jeffrey K. Griffiths and Tefera Belachew

Introduction: The current prevalence of stunting in Ethiopia (DHS 2011) is about 44% (children under five). Factors that are known to be associated with the risk of being stunted include insults that occur in gestation and early life. Low birth weight and length are consistently linked to a higher risk of stunting. The aim of the study was to examine birth weights, length and length for age Z-score in infants born in the ENGINE Cohort study from 2014 through 2015 and understand associated factors.

Methods: Data for this analysis is from the ENGINE birth cohort study and include variables from pregnancy and birth (n=3862) in three woredas of Oromia region. The main outcome variables are birth weight, birth length and length for age Z-score. These include gestational age, maternal MUAC, maternal height, education (literacy and numeracy), anemia status, use of iron supplements in pregnancy, number of antenatal visits, deworming during pregnancy, age, wealth index, maternal diet diversity score (pregnancy and at birth), food security, domestic violence and religion. Descriptive statistics, means and standard deviations were generated and bivariate relationships tested followed multivariate linear regression modeling. Standard errors were clustered at the kebele level and interactions explored.

Results: A total of 98% of live births were observed with few still births and miscarriages across all three woredas. Mean (\pm SD) birth weight was 3.13 kg (\pm 0.41) with the highest in Goma and lowest in Tiro Afeta. Prevalence of low birth weight was just under 5%. Birth Length was 49.51 ± 2.17 while mean length for age Z-score was $-0.18 (\pm 1.15)$ with 6% stunting in all the infants, the lowest level was observed in 1.9% in infants born in Goma, 5.6 % in infants born in Tiro Afeta and 11% in infants born in Woliso. Linear regression analyses are being conducted to examine the relationship of factors such as maternal MUAC and height, maternal dietary diversity, wealth index, religion/ethnicity, gender of the child, gestational age, wealth index, maternal dietary diversity and number of live births. .

Conclusions: Prevalence of low birth weight was lower than national average and other studies. Prevalence of stunting was at 6% in pooled sample with the highest level in Woliso, the negative mean length for age implies early onset in the direction of stunting. These analyses will allow the elucidation of factor associated with Factors mean length, mean birth weight and mean length for age.

8.8. Concordance of child feeding and caring practices and its predictors in southwest rural Ethiopia

Netsanet Fentahun, Carl Lachat and Tefera Belachew

Background: Inappropriate child feeding and caring practices are a major cause of malnutrition. To date, no studies have examined concordance and discordance of child feeding and caring practices and their predictors in developing countries.

Methods: We used baseline data generated from 2 year-long longitudinal Agriculture–Nutrition panel surveys conducted February 9 to April 9, 2014, in nine districts encompassing 20 randomly selected counties in Oromia Region and Southern Nation, Nationality and Peoples Region in Ethiopia. Households were recruited using the Expanded Program on Immunization sampling method. Six hundred twenty three children under the age of five years and their respective caregivers were included in the analyses. Generalized estimating equations were used to account for clustered observations.

Results: Concordance of poor child feeding and caring practices was observed in 45.1% of the children, while 45.5% of the children were suffering from discordance of poor child feeding and caring practices. Concordance and discordance of poor child feeding and caring practices had almost different predictors. Concordance of poor child feeding and caring practices was significantly associated with age of the caretaker of ≥ 40 years (OR=2.14; 95%CI (1.04, 4.41)), low household dietary diversity (OR=3.69; 95%CI (1.93, 7.04)), medium household dietary diversity (OR=2.17; 95%CI (1.17, 4.00)), severe household food insecurity (OR=1.72; 95%CI (1.01, 2.93)) and increase with increasing child age.

Conclusions: A substantial number of children in the southwest of rural Ethiopia are exposed to both poor child feeding and caring practices. Low household dietary diversity and extreme food insecurity household were predictors of concordance of poor child feeding and poor caring practices and provide useful entry points for comprehensive interventions to address child feeding and caring in the area.

Session 4: Multi-sectoral, nutrition specific and nutrition sensitive interventions and nutritional status

8.9. Impact of ENGINE livelihood interventions on most vulnerable households

Elizabeth Drummond, Cherinet Abuye, Carolyn O'Donnell, Kebede Tafesse, [Daniel Abbott](#) and Habtamu Fekadu

Background: USAID/ENGINE is a multi-sectoral nutrition project working in 116 woredas in five regions. Nutrition sensitive livelihood interventions in Amhara, Oromia, SNNP and Tigray regions included targeting 15,070 most vulnerable households (MVHs) for direct support and promotion of homestead gardening, rearing small livestock and poultry, and training and nutrition education to increase production and consumption of diverse foods at the homestead. ENGINE's external mid-term evaluation recommended that the project conduct periodic surveys to measure key outcome indicators among targeted most vulnerable households (MVHs).

Objective: To assess the operation and outcomes of ENGINE's program activities with most vulnerable households, including determining if participation, and the degree of participation, in ENGINE activities leads to improved nutrition practices; the relationship between household assets provided by the project and nutrition practices; and the relationship between gains in household income and nutrition practices.

Methods: Two cross-sectional surveys were conducted among the same 830 project supported vulnerable households, a census of all supported households in 10 woredas, in Nov/Dec 2014 and Sept 2015. Cohort One (C1) (n=483) had been in the project for one year at the time of the first survey and 22 months at the second survey; cohort two (C2) (n=347) had not been reached by the project at the baseline and had been supported for 10 months at the second survey.

Results: Improvements were seen between the surveys in both cohorts in key indicators including, early initiation of breastfeeding (C1 from 55.2% to 61.4%, and C2 from 56.6% to 62.1%), use of IFA (C1 from 58.9% to 63.9%, and C2 from 61.3% to 66.1%), exclusive breastfeeding (C1 from 78.9% to 90%, and C2 from 77.4% to 85.7%), minimum acceptable diet (MAD) (C1 from 14.8% to 25.8%, and C2 7.7% to 18.5%), and minimum dietary diversity (MDD) (C1 from 13.8% to 26.1%, and C2 7% to 25.5%). Maternal dietary diversity did not increase as significantly, with the mean maternal dietary diversity score constant at 2.9 food groups across both time points in C1, and an increase from 2.6 to 2.9 in C2.

Significant increases in ownership of livestock were observed in line with program activities, including an increase in C1 heifer ownership from 9.8% to 29% as a result of MVHs selling sheep and other assets and purchasing heifers. Sale of vegetables did not increase. Separation of animals from the HH increased from 35.2% to 45.1% in C1 and from 14.7% to 34.6% in C2 through promotion alone. Participation in program activities (cooking demonstration, agronomic demonstration, savings) was associated with improved outcomes. Children whose mothers had participated in cooking demonstrations were more likely to have adequate dietary diversity (C1 = 34.8% and C2 = 25.7%) than those who did not

participate (C1 = 12.2% and C2 = 21.4%). More HHs in both cohorts received information on dietary diversity and received the information from more sources in the second survey. At baseline, 10.1% and 67.3% of C2 HHs had received no information or information from one source, respectively. Ten months later, only 0.6% of HHs had received no information, and more than 53% of participants had received information from three or more sources.

Conclusion: Annual surveys to determine status of key outcome indicators provide insight and actionable information for program implementation. HH participation in ENGINE activities appears to have led to improvements in CDDS, MAD, and breastfeeding indicators, despite greater food insecurity in the second survey. Participation in more components and greater exposure over time and through multiple channels increases the likelihood of improved practices. MVHHs had an increase in income from sale of animal products, but households were more likely to retain vegetables for household use.

8.10. Access of Nutrition Specific and Nutrition Sensitive Messages in Ethiopia: A Qualitative Gendered Comparison

Min-Barron, Jennifer Coates, Shibani Ghosh, John Maluccio, Beatrice Rogers

Background: The rise of multisectoralism, in conjunction with the increased interest to improve women's empowerment in the agricultural sector, has led to a dynamic and gender focused effort to improve nutrition outcomes through nutrition sensitive interventions. Questions still remain, however, on how well, at the programmatic level, nutrition education through nutrition-sensitive platforms (such as agriculture and social safety nets) translates into adoption of nutrition-related behavior change. This qualitative research study compares how nutrition sensitive and nutrition specific education and messaging is accessed and adopted by men and women in the Ethiopian household economy.

Methods: With a sample size of 32 focus group and 10 key informant interviews, this research study was conducted in two main regions within Ethiopia, Oromia and the Southern Nations, Nationalities and People's Region (SNNPR). Focus groups participated in a unique participatory 'Gender Box' activity in which the group was asked to identify nutrition related behaviors and then designate them to either a female, male or 'both male and female' box, depending on the perceived gender of responsibility.

Results: Results indicate that nutrition specific messages (such as exclusive breastfeeding and cooking) are primarily accessed by women through the health sector but perceived by women to have be the responsibility of both the male and female. Nutrition sensitive messages (such as diversification of crop production) are generally accessed by men through the agricultural sector and media. Perhaps most interesting, however, is the message sharing and discussion process. Nutrition specific messages accessed by women are often discussed and shared with their male spouses. Nutrition sensitive messages accessed by men, however, were rarely discussed in the home after exposure.

Conclusions: Results from this study provide great insight into the process of nutrition message access and sharing within the household. Results also point toward perhaps a necessary shift away from individual targeted nutrition education to the provision of nutrition education to the household couple, thereby fostering and promoting discussion and message sharing between both genders.

DAY TWO

Session 5: Dietary patterns, diets and food security

8.11. Implication of khat production and consumption practices in khat growing rural household regions of Ethiopia

Beyene Wondafrash.

8.12. Predictors of Intra-household food and nutrient allocation inequity in Ethiopia

Jennifer Coates, Bryan Patenaude, and Beatrice Rogers

Background and Objective: The objective of this paper is to understand the drivers of different types of inequities in household food and nutrient allocation.

Methods: Data derive from 1196 households that were randomly sampled from 10 woredas in Oromia and SNNPR. The panel was followed four times over two years, through two post-harvest and 'lean season' periods between 2014-2015; this analysis draws on data from the second round. The 1196 households were classified according to the degree to which they exhibited any of the following types of inequity, between: adult females v. adult males; children v. adult males; children v. all adults; and female children v. male children.

Results: Multivariate OLS regression models predicted the degree of inequity amongst these combinations of household demographic groupings in terms of energy, protein, and iron. The outcome variable, inequity, was defined as the ratio of average nutrient adequacy of the interest group (e.g. female children) to the average nutrient adequacy of the reference group (e.g. male children). Logistic regression models predicted inequity expressed in binary terms, as equaling 1 if the ratio of average nutrient adequacy of the interest group to the reference group was less than 1, which signifies any adequacy inequity.

Predictors in these models included: food security status, female empowerment status, total household education, total female education, male to female education ratio, household dependency ratio, wealth quintile, female headed household, male to female ratio, household size, food security (HFIAS) category, and male physical activity category. When comparing the intake adequacy of male and female children, to that of the reference group, adult males, the results show that, across calories, iron, and protein, total household education and protein adequacy were significant predictors of child-adult male inequity, whereby an increase in total education and protein adequacy increased inequity. Total female education, male to female education ratio, and dependency ratio were all significant at the .05 level; greater levels of these factors were associated with decreases in inequity.

Findings for the comparisons of inequity between children and adults showed roughly a similar pattern. The ratio of female child adequacy to male child adequacy was significantly associated with male to female ratio and female headedness, where increases in these variables were associated with greater inequity. Greater household size was associated with a more equitable distribution of nutrients relative to need. Adult female adequacy relative to that of adult males was predicted by protein adequacy, total household education, dependency ratio, and male to female ratio (increases in all of these variables were associated with significant increases in inequity, while total female education was, as in the other models, a significant positive predictor of decreased inequity).

Conclusions: The results of these analyses deepen our understanding of intra-household food and nutrient allocation in Ethiopia. Qualitative work is warranted to further explain the mechanisms behind these results. Meanwhile, programs and policies would do well to consider the intra-household effect of household food transfers, and strive to influence cultural norms and alleviate resource barriers in order to achieve greater food security for all nutritionally vulnerable household members.

8.13. Predictors of 'diet diversity smoothing' during the lean season in Ethiopia

Jennifer Coates, Kate Spielman, Dianna Bartone, Katie Heneveld, Michelle Borges, Natalie Theys and Meghan Kershaw

Background: This study sought to understand: 1) the extent to which households in two regions of Ethiopia manage to smooth their dietary diversity across seasons; and 2) the household-level factors that are associated with successful smoothing.

Methods: The analysis draws data from a panel of 1,200 randomly sampled households in Oromia and SNNPR that were surveyed four times -- during two 'post-harvest' and two 'lean season' periods -- between 2014 and 2015. After exclusions for missing data, a total of 1,007 households were included in the analysis. Successful dietary diversity smoothing was defined by 1) maintaining or improving a dietary diversity score to at least 5 food groups across the post-harvest and lean seasons, and 2) consumption of nutrient-dense foods (fruits, vegetables, and/or animal source products) across multiple seasons.

Results and Conclusions: The study hypothesizes that greater production diversity, greater nutrition knowledge, empowered women, market access, and greater levels of participation in ENGINE nutrition-sensitive activities will be associated with smoother dietary diversity across seasons. Although no clear population-level seasonal trends in dietary diversity emerge, preliminary results suggest that households with a younger household head, greater per capita wealth, and empowered women were more successful dietary diversity smoothers (defined as maintaining a score at or above 5, compared to the reference category of starting with but not maintaining a dietary diversity score at or above 5).

Furthermore, when controlling for baseline diet diversity score, households with a male household head, greater per capita wealth, empowered women, and who did not fast the previous day consumed significantly more nutrient dense foods during the lean season. Overall, consumption of nutritious foods such as meat, fish, eggs, and fruit remains low during all seasons, while consumption of legumes appears to drop during the lean season. These results are expected to inform food-based approaches to protecting the diet quality aspect of household food security.

Session 6: Nutrition Policy Research in Ethiopia

8.14. Multisector Nutrition Program Governance and Implementation in Ethiopia: Opportunities and Challenges

Eileen Kennedy, Masresha Tessema, Tesfaye Hailu, Dilnesaw Zerfu, Adamu Belay, Girmay Ayana, Desalegn Kuche, Tibebu Moges, Tsehai Assefa, Aregash Samuel, Tarik Kassaye, Habtamu Fekadu, and Joan Van Wassenhove

Background: Governments globally are stressing both direct nutrition interventions combined with nutrition sensitive policies and programs to combat malnutrition. Governance at all levels has been identified as a critical element in ensuring success of national nutrition plans. For example, the most recent National Nutrition Program (NNP) in Ethiopia discusses the essentiality of governance and coordination at all levels.

Methods: The research uses a qualitative study based on semi-structured interviews with key informants. The research discussed in this article focuses on governance structures from national to regional to district level in Ethiopia with an emphasis on translation of a strategy and implementation of the NNP. This article concentrates primarily on results from the national and regional levels.

Results: Data at both the national and regional levels indicate that there is general agreement on the nature of the nutrition problems in Ethiopia. At all levels of government, under nutrition, food insecurity, and micronutrient deficiencies were listed as the main nutrition problems.

Conclusions: The challenges in governance and implementation identified at both the national and regional levels, however, varied. The implementation of the 2013 NNP was in its early stages at the time of this research. While there was palpable energy around the launch of the NNP, respondents indicated issues related to leadership, coordination, collaboration, advocacy, and budget would be challenges in sustaining momentum.

DOI: 10.1177/0379572115611768

8.15. Ethiopian National Micronutrient Survey

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Background: Health and vitality of human beings depends on diets with adequate amounts of vitamins and minerals. The adverse effects of micronutrient deficiencies are most severe on children, pregnant women and the developing fetus. Approximately 30% of the world's population is unable to use their full mental and physical potential as a result of micronutrient malnutrition. In Ethiopia vitamin A, Vitamin B12, Iodine, Iron, and Zinc are public health important.

Objective: The objective of this study was to estimate the prevalence of anemia, iron deficiency, vitamin A deficiency, zinc deficiency, iodine deficiency and adequately iodized salt access in Ethiopia.

Methods: Cross sectional study with a representative sample of nine regions and two city administrations of the country was conducted from March to July 2015. Information related to household (HH) characteristics, socio-economic and demographic were collected. In Ethiopia the prevalence of inflammation as measured by CRP and AGP among under five children, school age children and non pregnant women of reproductive age were 44 %, 31.6 % and 27.3% respectively.

Results: The prevalence of anemia adjusted for altitude among preschool children, school age and non pregnant women of reproductive age were 34.6, 25.6 and 17.8 %, respectively, and the deficiency was higher among rural residents. Iron deficiency among preschool children, school age children and women of reproductive age as measured by ferritin and adjusted for inflammation was 17.8, 9.1 and 10.0% respectively. Whereas national prevalence of iron deficiency among preschool children, school children and women of reproductive age as measured by STFR was estimated 29.6%, 19.5% and 16.4% respectively. Therefore, the deficiency of tissue iron and depleted body iron stores is more prevalent among preschool children than the other target groups. Nationally vitamin A deficiency was 14%, 10.9% and 3.4% in the preschool children, school children and women of reproductive age respectively. The national vitamin A supplementation coverage in the preschool age children was 63%. Among the survey population of zinc deficiency was 35, 36 and 34% in the preschool children, school age children and women of reproductive age respectively. Prevalence of iodine deficiency in school age children and women of reproductive age whose mean urinary iodine concentration below the cut-off were 48% and 52% respectively. Only about 26% of the households were getting adequately iodized salt.

Conclusions: Based on the current survey findings, Zinc, Vitamin A, B12 and Iodine are public health problem. Since the magnitude of the deficiencies of these micronutrients are widely varied among different target groups targeted intervention required to address the deficiencies.

9. Poster Presentations

9.1. Comparability of LNMP and Ultrasound in estimating gestational age during early pregnancy

9.1. Determinants of multiple anthropometric deficits in southwest rural Ethiopia: Conventional verses composite anthropometric index

Netsanet Fentahun, Tefera Belachew and Carl Lachat

9.2. Validation of the Patient Health Questionnaire (PHQ-9) as a Screening Tool for Depression in Pregnant Women: Afaan Oromo Version

Yitbarke Kidane Woldetensay, Tefera Belachew, Markos Tesfaye, Eva Johanna Kantelhardt Kathryn Spielman and Veronika Scherbaum